

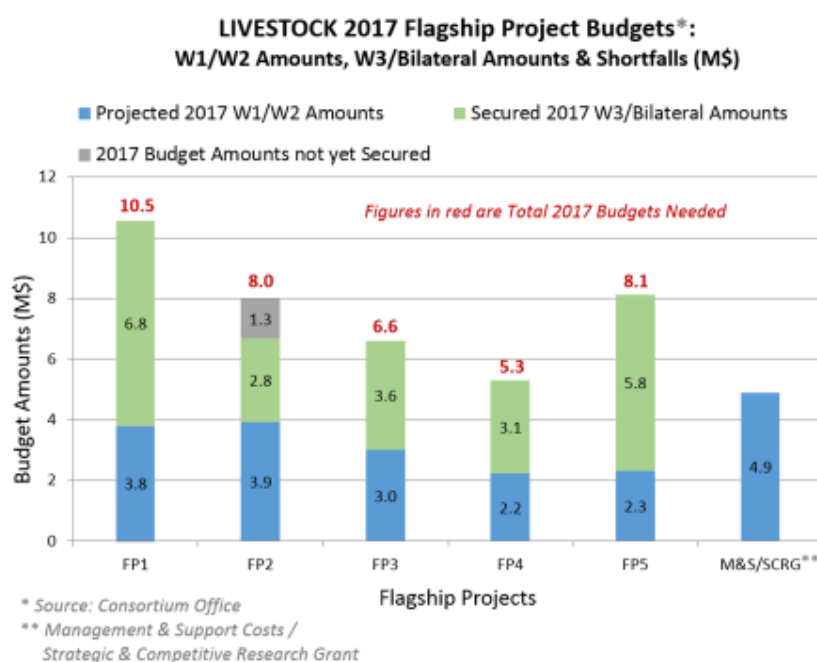
ISPC Commentary on the full proposal for the CRP on Livestock Agri-Food Systems for Phase 2 (2017-2022)

Summary

CRP-Livestock aims to enable the transition of smallholder farmers, pastoralists, and agro-pastoralists as well as value chain actors to sustainable, resilient livelihoods and productive small-scale enterprises. Research spans multiple commodities – cattle (milk and dual-purpose milk-beef), poultry (eggs and meat), pigs, sheep and goats, and aspires to deliver on all three CGIAR SLOs.

The full proposal has attempted to take on board the ISPC recommendations and comments from the pre-proposal stage, and has greatly improved the narrative. The proposal has adjusted the Theory of Change (TOC), impact pathways and aspirational targets, and the increased level of detail, transparency in assumptions and attention to change processes is welcome, although some targets need a revisit. Priority research areas under each Flagship are better clarified through activity clusters, although more information on findings from the prioritization exercise and how priorities reflect the TOC is needed. The partnership section now includes information on roles and responsibilities of critical partners, and developing country partners have been identified for certain activities at the Flagship-level.

The budget request for the Livestock CRP is US\$ 296 million over six years, with 46% expected to come from W1/W2. The figure below shows the distribution of W1/W2 funding requests by flagship compared with the secured W3/bilateral funds for 2017.



FP1: Livestock genetics

FP2: Livestock health

FP3: Livestock feeds and forages

FP4: Livestock and the environment

FP5: Livestock livelihoods and agro-food systems

The ISPC notes the progress made by the Livestock CRP in responding to earlier ISPC commentaries, but notes that the full proposal still scores lowly against at least one of the criteria used by the ISPC to

review the full proposals. The ISPC also requests that the CRP proponents take note of all the comments provided in the document, but in particular provide an addendum which addresses the points highlighted below. Alternatively, the proponents can choose to rewrite relevant sections in response to any of the comments, provided the sections which have been rewritten are highlighted in the proposal document. The addendum and full proposal document should be submitted to the System Office by 31 July 2016.

- For all Flagships, additional explanation on scientific opportunities identified through the priority setting process and their relevance to CRP and Flagship-level Theory of Change is needed. Such a narrative should include evidence on the most important constraints to achieving stated objectives (identified from past work), and how research can address these constraints and deliver outcomes/impacts.
- Present further clarification on the scientific rationale underpinning the research focus on improved livestock breeds, vaccines, and improved feeds and forages; how the broader technical advances will lead to research success within six years; and, how risks will be mitigated or managed.
- Provide additional information on the functional integration with other AFS CRPs to clarify how the Livestock CRP will influence trait discovery in crop breeding CRPs and assess potential trade-offs between the uses for crop and livestock production.
- Even though the targets are overly optimistic for many CRPs, Livestock is an outlier in that some of the targets proposed (number of people likely to be lifted out of poverty, rate of yield increase) do not appear credible. These targets should be revisited or additional justification, grounded in empirical evidence, provided for the numbers quoted.
- Include additional detail on the CRP's relationship with the private sector, and how this contributes to maximizing Livestock's comparative advantage.

1. Overall analysis of the full proposal as an integral part of the CRP portfolio

Strategic relevance

The Livestock CRP makes a reasonable case that livestock systems belong in the CGIAR research portfolio. The argument rests on several premises: (a) demand for animal-sourced foods is rising rapidly, with almost all the increase being in developing countries; (b) animals contribute in significant ways to smallholder farming systems, particularly as sources of income and resilience; and, (c) smallholder farms can, will, and should be the major suppliers of animal foods in developing countries, and should do this in a manner consistent with sustainable livelihoods. The CRP's stated objectives are to increase incomes for producers and livestock value chain participants, improve nutrition through increased access to animal-source food, and to ensure the environmental sustainability of the livestock sector. The research for development agenda is grounded in the focus systems and value chains, particularly in Africa. The commodity focus is on cattle (milk and dual-purpose milk-beef), poultry (eggs and meat), pigs, sheep and goats. While most emphasis is on inclusive sustainable intensification in mixed crop-livestock systems, some attention is paid to increased resilience to risk for pastoralists and agro-pastoralists in fragile systems.

The proposal's argument for strategic relevance could be made more compelling by bringing evidence to bear on the centrality of the proposed research for increased smallholder-based livestock sector productivity and growth. This is an important issue for the CRP to clarify: explicate the arguments and assumptions that the research areas proposed are likely to play a critical role in the growth of smallholder-based animal agriculture production. The CRP is designed entirely around the premise of growth in the smallholder livestock sector, and if it is false, the research agenda of Livestock would not be able to deliver what is promised

Consideration of the 'grand challenges'

The proposal specifies many links between livestock-related research and grand challenges identified in the SRF, particularly greenhouse gas emissions, climate-related resilience, water use, nutrition and food safety. Grand challenges appear to influence the design of the CRP – for instance, in the case of the environment flagship considering the contribution of livestock production systems to emissions and other environmental indicators. One instance where the aspirational impact target is questionable is nutrition – existing evidence suggests that increasing the productivity and efficiency of livestock systems (a primary focus of the CRP) is not sufficient to combat malnutrition in the poor producer households and thus greater clarification of the scientific rationale for this target will strengthen the proposal.

Evidence of capturing inter-CRP synergies

The proposal envisions productive and close relationships with a number of other CRPs, particularly with integrating CRPs i.e., A4NH (co-lead on human health related aspects), CCAFS (co-investment in emissions work, climate policy), and WLE (water use efficiency, land degradation and restoration), all of which is detailed in Annex 3.6. The interaction with PIM is focused primarily on modification of the IMPACT model to include livestock for foresight and ex-ante impact studies, along with some attention to tenure and rights issues. There are other potential overlaps with PIM in the areas of value chains and livelihoods (FP5) as well as on policymaking (agricultural and environmental) to deal with incentives for livestock production and environmental externalities. In these cases, however, the collaboration with PIM is not obvious in the proposal.

The proposal should better describe (in the requested addendum) the strength of integration with crop AFS CRPs. According to the TOC, the objective of the CRP is not just to increase productivity of animals within smallholder systems, but also to raise overall farm income. That means that livestock activities must be seen in the context of the broader livelihood systems, adding value to production of crops rather than simply displacing crop activities. The modes of integration will be key. These linkages with the crop CRPs are thus vital and need to be clearly laid out.

The use of crops for animal nutrition may involve trade-offs in food/feed properties and create competition for traits, have implications on resource management (e.g., impacts on soils or competition for land), and the environment (e.g. emissions related to land use change or enteric methane production). However, the full proposal focuses on the development of high quality feed and forage crops, with only limited attention given to a systems perspective through activities in FP3, FP4, and FP5. Including the specific details (e.g., trait demand assessment, track record, potential trade-offs and implications for research, etc.) in the approach to developing ‘*key full-purpose crop cultivars that have enhanced residue fodder traits (in collaboration with other CRPs)*’, and taking a systems perspective and considering overall farm income impacts will strengthen the proposal. As is, the CRP limits itself to providing information on nutritive value of crop residue to other CRPs that may or may not use that information for trait discovery and breeding work.

Rigor and credibility of the scientific arguments

Providing stronger evidence of the rigor and credibility of the scientific arguments would strengthen the proposal. It should include a review the recent research successes (inside and outside of CGIAR) that could lead the way to a new round of innovations. It should indicate the state of understanding on the promising pathways for agricultural innovations as they relate to livestock systems. Examples of innovative work on livestock value chains, property rights in livestock systems, or integrated crop-livestock systems that have led to major gains in rural prosperity should be cited. Such an analysis would pave the way for a discussion on research prioritization, indicating activities to be emphasized, as those to be dropped or reduced. While results from an ex-ante prioritisation is presented in the proposal annex, the rationale section on choices made needs to be expanded to fully appreciate the results and how they have been used.

Individual FPs add up to a CRP that offers more value than the sum of individual FPs

The five Flagships of the CRP focus on: 1) animal genetics, 2) animal health, 3) feeds and forages, 4) environment, and 5) livelihoods and agri-food systems. This configuration of FPs appears to make sense, and to cover the breadth of problem areas being addressed. The FP components include a comprehensive set of approaches that span biophysical, socio-economic, and policy/institutional research arenas. However, issues that were raised in the ISPC pre-proposal commentary remain pertinent. The CRP has responded to ISPC's comment on whether or not the environment FP (FP4) should have been a separate FP or integrated across other FPs (see discussion under FP4). The same issue arises in the context of FP5 on livelihoods and agri-food systems (FP5). It is not obvious this work should occur outside of other FPs. At the least, the integration across these FPs will be essential.

Lessons learned

The proposal now includes work on poultry genetics – an area that had previously been viewed as unpromising for smallholder value chain development, but the ISPC supports this inclusion. The increased focus on livestock's environmental footprint and value chains are both areas that have been strengthened, and the case is well made at the FP level. This is an indication that there has been some rethinking of opportunities and constraints, but the CRP should clarify the scientific criteria underpinning these changes at the FP level or cluster level to strengthen the proposal. As indicated, the science section will need additions to indicate how research priorities have been shaped by innovations/advances as well as past successes/failures. The IEA review (2016) noted that the current CRP Livestock and Fish had delivered few outputs or progress towards outputs that could be considered scalable and game-changing. Compelling examples of where transformative changes have occurred through prior work and how this has shaped the CRP's research agenda would hence strengthen the proposal.

Site integration

The CRP has demonstrated its strong commitment to participate fully in the site integration plans that have been developed. The locations seem well-suited for the anticipated program of research, and eight out of the nine value chain research hubs overlap with new site integration (+ and ++) countries. Some explanation on how these existing hubs will be approached in the context of site integration would strengthen the proposal. **This could be included in the part of the addendum that considers interactions with other CRPs.**

2. Theory of Change and Impact Pathway

The proposal has adjusted the TOC, impact pathways and targets in response to pre-proposal comments. The increased level of detail, transparency in assumptions, and attention to change processes (spheres of control, influence, and interest) is welcome. The CRP TOC identifies the problem as one of meeting the growing demand for animal products in developing countries at low prices and with minimal environmental damage, ideally in a manner consistent with inclusive growth patterns. The solution offered is to promote research that is focused on smallholder animal agriculture (including medium scale commercial operations) and pastoral livestock systems.

The ISPC has some doubts about this TOC. The growing demand for animal-sourced foods is clearly real, but smallholder systems will need to compete both with imports and with larger commercial systems. Nevertheless, the ISPC judges that the TOC is plausible and can reasonably be viewed as a working hypothesis. At some stage in the future, it may be useful to revisit this TOC and to scrutinize it more closely. The CRP may want to consider ways in which research priorities might change if it turns out that smallholder systems are not the place where the CRP can make its biggest contribution. The intention expressed in the current proposal is to focus research on two sets of challenges (representing two systems or trajectories) related to rapid inclusive growth systems and fragile growth systems, and value chains. The problem areas identified are undoubtedly important, but the proposal should make a stronger case on how the proposed research will address these problems. **The addendum should make clear how specific research opportunities identified reflect the Theory of Change, and how research will deliver impact in the specified timeframes (additional, but related issues are discussed in the Flagship-level comments).**

The outcome and impact targets are highly ambitious in nature, but this is true across the CGIAR portfolio. For instance, the proposal envisions lifting 18 million people out of poverty by 2022 through livestock research (in synergy with other CRPs – DCL, Fish, Maize, PIM, Rice, RTB, and Wheat). By comparison, between 2005 and 2012 (a period of roughly the same length, and the most recent one for which data is available), the World Bank's PovCalc database estimates that the number of poor (at US\$ 1.50/day) in Sub-Saharan Africa fell by about 8 million people. (At a poverty line of US\$ 1.90/day, the number of poor people in SSA actually increased by 7 million). This was at a moment of rapid economic growth across Africa. **In the light of such data, the proposed poverty-related target appears unrealistic, and this issue should be addressed in the addendum.**

3. Cross-cutting themes

Gender and youth

The gender strategy articulated by the CRP in its full proposal is one of the more thoughtful approaches among all CRPs. IEA (2016) noted that the gender strategy underpins all Livestock and Fish CRP work (even if the level of integration varies across FPs), and that the gender community of practice (COP) has been successful in communicating on a regular basis. What would strengthen the strategy is explicit recognition that some of the linkages articulated between livestock, gender (in this context, women), and potential impacts on nutrition or empowerment are worthy of continued scientific enquiry.

The justification that the youth population in developing countries will remain high, that they are producers of the future and may have more capacities to absorb new technologies and management strategies, and hence need a special focus seems reasonable. However, the strategies for incorporating youth into livestock remain analytically focussed (e.g., research on inclusion of young people in institutional arrangements in value chains) or is described in general terms only (e.g., engage youth in animal health field monitoring and research activities, support youth to produce and market quality forage seeds etc.). This is understandable at this stage but moving forward, identification of implementation strategies and possible specific solutions will be needed.

Enabling environment

The proposal discusses the enabling policy environment in multiple instances, especially in relation to genetic conservation, breed improvement, and environment/climate change. The challenge of guiding the development of regulatory regimes that are simultaneously effective and support the smallholders (whom the CRP seeks to promote), however, is not explicitly discussed. Consider, for instance, the areas of animal health, food safety or environmental regulation. In all cases, a system of tight and effective regulations is likely to favour large producers who can bear the costs of compliance. It then raises questions on the appropriate balance between the interests of consumers and producers, and between small and large producers. The same would hold true for land use regulations or policies aimed at curbing greenhouse gas emissions. More consideration of the trade-offs and tensions embedded in the enabling environment will be required as the program evolves.

Capacity development

Capacity development is extensively discussed at the CRP as well as the Flagship level. The range of initiatives span traditional i.e., training Masters and PhD students or developing learning materials, and more directed approaches i.e., addressing information needs and promoting organizational development through specialised hubs. Flagship 5 (livelihoods) as well as clusters within other FPs address the capacity development of primary beneficiaries (smallholders) by targeting their capacity to innovate.

4. Budget

The budget request by the Livestock CRP is US\$ 296 million over six years, or about US\$ 49 million annually. The proportion of W1/W2 to total FP budget varies from 28% (FP5, livelihoods) to 49% (FP2, livestock health). While two FPs (FP1, livestock genetics and FP2, livestock health) also expect W3 funding, others rely on W1/W2 and bilateral only.

Management costs are budgeted at 5% of the CRP budget, with an additional six percent (6%) in a 'Strategic Investment Fund'. The Strategic Investment Fund is justified as an instrument for adaptive management that will be utilized for priority cross-cutting activities (presumably newer activities over and above existing investments in FPs); targeted topics such as research gaps and joint activities across CRPs and flagships; proof-of-concept pilots for new research areas; and impact assessments.

The CRP plans a budget of US\$ 200,000-300,000 (annually) for impact assessments, which the ISPC considers insufficient. This excludes staff time (US\$ 100,000) for leading impact assessment and M&E work as well as ex-ante IA and M&E activities¹. It is highly encouraging, however, that four out of five FPs have identified potential topics for future impact assessments.

5. Leadership and partnership

The CRP leadership and management structure seems viable. In accordance with the governance recommendations developed by the Consortium Board, an Independent Steering Committee (with an independent member as Chair) will replace the CRP-Livestock and Fish Science and Partnership Advisory Committee (SPAC). The Program Management Committee (PMC) chaired by the CRP Director supports the ISC. New candidates for the ISC membership (Annex 3.10.5) bring additional expertise on health, livestock systems and environment, and quantitative genetics (skills not a part of the existing SPAC). The proposal includes a detailed ToR for selection of the new CRP Director, which seems appropriate. Since the pre-proposal, a new FP leader has been recruited for FP5. Other FP leaders and staff include scientists with relevant competencies and strong track records. However, the CRP should reconsider if 25% of an internationally-recruited scientist's time in the Program Management Unit (PMU) is sufficient to lead the impact assessment as well as evaluation work.

The CRP is a collaboration between CIAT, ICARDA and ILRI, with the Swedish University of Agricultural Sciences (SLU) as a Tier-1 research partner and GIZ as a Tier-1 technology delivery partner that will also bring perspectives on local/international development innovation processes. FP leaders are drawn from CIAT, ICARDA, ILRI or SLU, reflecting the disciplinary structure of FPs. Tier 2 partners include ICRAF, IWMI and Wageningen University. FPs have also identified additional (specialist) research and delivery partners. The creation of institutional entities like Mazingira Center can be viewed as major positive steps towards long-term development of science, and has the potential to contribute to capacity development. **While there is a discussion of roles and responsibilities relative to a small (but significant) number of partners, there is much less with respect to the private sector.** This issue has been identified across the ISPC review of livestock research (2014), ISPC's pre-proposal commentary (2015), and the IEA evaluation of Livestock and Fish (2016). Another gap to be addressed is a careful consideration of the comparative advantage of the CRP/CGIAR in the livestock research space relative to the universe of other potential providers (including the private sector), and how their comparative advantage is strengthened through the proposed partnerships. **The ISPC requests Livestock to include additional detail on the CRP's relationship with the private sector, and how this contributes to maximizing its comparative advantage in an addendum to the proposal.**

6. Flagships

Note: comments on budgets for individual FPs are included only where there are questions or specific issues raised about them. Otherwise, the distribution of budget by FP is shown in the figure on the summary page.

Flagship 1: Livestock genetics

This flagship aims to apply new genetics and genomics opportunities to the developing world, building on the recently increased recognition that genetic improvement in low-input smallholder livestock production systems, when combined with appropriate management strategies, represents a significant and largely untapped opportunity to increase livestock productivity.

¹ Namely, ex-ante impact assessment/prioritization (US\$ 50,000), change pathway monitoring (US\$ 60,000), external evaluations (US\$ 150,000), M&E within bilateral projects (US\$ 100,000) and online program (US\$ 20,000)

The underlying assumption of this FP is that improving the genetics of indigenous and exotic livestock breeds will be key to increasing productivity. The argument is made that new genomics approaches, breeding and reproductive techniques will allow for substantive advances in the pace of genetic improvement within indigenous breeds. Also, that the diversity in indigenous livestock and crossbreeds will allow continuous genetic gains down the generations (through design of tailored breeding programs). This effort will focus almost exclusively on African production systems and will include poultry (Ethiopia, Tanzania and Nigeria), pigs (Uganda, Vietnam), sheep and goats (Ethiopia) as well as dairy cattle (Ethiopia and Tanzania). **A stronger justification for the relevance of the proposed research should be included in the addendum, including evidence that the genetic potential of livestock species is a limiting factor in these systems.**

It is welcome that FP1, in response to ISPC, has revisited expected outcomes and identified new targets. The proposal still envisions large impacts in genetic gain (100, 50, 12, and 100 percent for chicken, pigs, small ruminants, and dairy cattle respectively) as well as increased productivity and income from the use of genetically improved breeds in combination with animal husbandry practices.

These newer targets still seem highly ambitious, unless these technologies are already fully tested or close to being fully tested and ready to go to the field. While the potential for genetic gain may be large, it is not clear that genetics are the limiting factor in these production systems. The farm-level impacts will almost certainly be smaller than these genetic gains, given that there are other constraints – especially relating to animal nutrition and the profitability of animal feeding. Hence, the argument that new technologies will lead to pervasive farm-level impacts within six years is questionable, even when these are delivered in combination with improved husbandry practices. Either the farm-level impacts must come from existing technologies, or the expected impacts of this research must be defined as being (somewhat) upstream of the farm. **Further details of the expected timeline to impact would help to allay these concerns of the ISPC, and the issues raised should be addressed in the addendum on the genetic gain targets.**

The proposal envisions a good set of relevant partner institutions. The Centre for Tropical Livestock Genetics and Health (CTLGH) co-established with University of Edinburgh and Scotland's Rural University College is at the core of the FP1 strategy for advancing science. Other academic partners include University of Nottingham and Wageningen University. The scientific quality appears to be high in the sense of aspiring to leverage advances in genomic, phenomic, and breeding research. Given that the likelihood of success can vary widely between species, an explanation of the links between genetics/genomics approaches and livestock trait performance, and documentation of past successes of productivity increases would strengthen the proposal.

Gender and climate change are mentioned as potential targets for genetic improvement, but this is a generic commitment rather than a well-defined strategy. The FP notes that gender attitudes towards breed attributes will be important, and these might then suggest targets for genomic work. There is recognition of the risks inherent in introducing livestock with altered genomic sequences, and the enabling environment that will be required to mitigate this risk. FP1 will collaborate with FP4 in mitigating the potential unintended consequences of its work, such as increased pressure on natural resources from more productive livestock, and partly address the potential negative effects on livestock biodiversity through full genome sequencing of the population concerned.

The CRP has allocated the largest proportion of its budget (27%) to this Flagship, and the largest proportion of W1/W2 resources (25%, similar to FP2). There are considerable research costs associated with animal breeding, and hence the justification needs to be stronger and targets realistic.

Flagship 2: Livestock health

The overall goal of the flagship is to improve livestock productivity, contribute to food security, nutrition and food safety through improved animal health, while increasing business opportunities for women and young people and reducing the negative environmental footprint of livestock production.

This Flagship bases its strategic relevance on the idea that livestock diseases are highly prevalent and cause significant losses to producers. As in the case of FP1, there are good reasons to believe that livestock health research belongs in this CRP, and it is reasonable to assume that animal disease research has strategic relevance, especially given relationships between livestock health and human health. A non-CGIAR academic partner (SLU) leads the FP. The TOC is conceptually coherent, but with some unresolved questions on impact pathways and assumptions.

The FP envisions a move towards “holistic” methods based on herd health. This is a welcome shift in focus, and it feeds into an alternative model of thinking about animal disease, i.e. that the impact of fighting single diseases by novel vaccines and treatments may be limited if other health conditions are not addressed, necessitating the need for a holistic approach is a reasonable claim. Different clusters, however, appear to make very different assumptions about key constraints. That is, the focus ranges from (i) tools and methods to evaluate animal health constraints and emerging threats; to (ii) refining and adapting herd health approaches (including appropriate drug use, husbandry, and animal welfare); to (iii) developing diagnostics and vaccines to improve animal disease control programs. A discussion of the critical constraints to better animal health – not just those supportive of activities in each cluster, and the extent to which animal disease is a constraint in various production systems would have strengthened the proposal.

The section would have also benefitted from a frank discussion of past failures and successes or lessons learned. This would have strengthened the case on science quality and plausibility of research successes, given some of these are not new areas of research. For instance, the FP justifies renewed optimism in vaccinology because of developments in genomics and high throughput ‘*omics technologies*’. **It is not evident, however, how or to what extent outcomes/impacts can be expected in a six-year timeframe, and these comments should be addressed in the addendum.**

The proposal is clearer than the pre-proposal on the diseases that it aims to deliver vaccines on (ECF, CBPP, PPR, ASF, CCPP, FMD, and RVF), and the differential approaches involved. That is, vaccines that require improvement (ECF, PPR) or diseases (e.g., trypanosomiasis) for which alternative control strategies might be more viable than vaccines. The proposal is less clear on what specific (rapid) diagnostic tools and inventions in herd health it aims to deliver, including the country-disease combinations it will target.

The longstanding CGIAR research in this area is said to provide comparative advantage. What is less clear is how the animal health sector has evolved and whether the set of actors have changed in such a way to alter this comparative advantage. In defining the role for the CGIAR relative to other public and private providers of services and technologies, is this primarily an advisory role (related to organization of animal health systems or focusing on animal health policies) or an area of upstream scientific research (developing vaccines, developing rapid diagnostics etc.)? Strategic science partnerships have been expanded since the pre-proposal and suitable justification on additional expertise/skills they bring is provided – this includes institutions in Africa (in Ethiopia, Uganda, and Tanzania). A good effort has been made to identify local or national partnerships for testing, refinement, and delivery of interventions and health packages – e.g., Tigray Institute in Ethiopia and Veterinarians without Borders in Uganda. Some collaboration with private sector entities/initiatives for specific disease-country combinations are also highlighted.

The flagship includes a good discussion of gender issues related to animal health. The pre-proposal commentary noted that candidate list of selected diseases included those considered to be of particular importance to women. There is scope for youth to be involved in significant ways along the animal health value chain, but how this has influenced the research agenda is not evident. Capacity development addresses both the capacity to apply research outputs at the farm level and to undertake research, particularly through the BecA-ILRI hub.

Flagship 3: Livestock feeds and forages

The goal of the flagship is to increase livestock productivity and reduce environmental impacts by identifying, testing and delivering superior feed and forage strategies and options, and by designing and implementing livestock value chains with reduced ecological footprints and positive environmental and social (gender- and youth-equitable) implications.

The ISPC accepts, without reservation, the idea that livestock feed and forage are a fundamental area for CGIAR research. Animal nutrition is clearly a constraint to productivity increases in much of the developing world, and especially within the smallholder systems that this CRP has targeted. FP3 works on four areas related to improved feeding: (1) understanding constraints and opportunities for enhanced feed and forage interventions; (2) developing forage, rangeland and crop cultivar resources; (3) improving utilization of existing feed resources; and, (4) identifying delivery and uptake options and business models, to reduce the spatial, seasonal, and inter-annual variation in biomass availability and support its focus on closing the yield gap. There is no question of strategic relevance – the issue of feed and forage is central to productivity of livestock systems, and feed resources is a limiting constraint to production in many developing country systems. A promising step forward is what appears to be a much-increased collaboration across CGIAR on feed and forages. Close linkages with other AFS CRPs is clearly important to achieve the objectives of this FP. **But, in the context of substantive past efforts by CIAT, ILRI, and other CGIAR Centers, evidence on the most important constraints to achieving stated objectives (e.g. technical, cost/profitability, market-orientation) and pinpointing changes that will deliver success over the coming years should be included in the addendum.** Relatedly, the FP claims that it ‘*makes particularly strong contributions to capacity development and environmental issues*’, but the relevant SLO3 sub-IDOs have not been identified and questions on what the associated impact pathways are, remain.

The science quality section focuses on tools rather than problems to be solved and a discussion of the strategy through which research might address these problems. If the main constraint has been the cost of transporting feed from places where crops are grown to where animals are raised, agricultural research may not offer much of a solution. What is then the role of new high tech feed additives (synthetic amino acids and enzymes) in a smallholder context? Similarly, while exciting developments in remote sensing are undeniable, do these developments address a current impediment? That is, is the lack of real-time information on palatability (pasture condition) a binding constraint for farmers? Without such rationale and prioritized testable hypotheses, the proposal may come across as highly optimistic about the potential impact of technical advances, as applied to feed and forage resources, on livestock productivity.

The main dimension of comparative advantage to consider is whether research is the relevant way to deal with feed and forage issues as opposed to encouraging the development of a private sector feed industry or fulfilling demand through imported mixed feeds or feed grains. The CRP also needs to consider that this might not be an issue to be ‘solved’ at the smallholder farm/household level. If one considers *feed and forage improvement research* as the relevant contribution, it is clear that there are no comparative providers of this scale. However, the case that CGIAR is the right actor to deliver *a better feed and forage sector* could be better made, and will come from clarity in TOC and science quality.

Gender and youth issues are adequately addressed. The forage and feed sector requires a systems approach that considers the role of multi-cropping (engaging with commodity CRPs), processing (post-harvest), policy and market development, and consistently assesses trade-offs (e.g. food security, nutrition, environment). Some of the enabling environment work (business models, extension approaches, etc.) is housed in CoA4. The FP also states that feed and forage technologies must be bundled with other interventions (animal health, genetics) to fully capture synergies, and this work will occur in FP5 through the cluster on optimizing livestock systems and the cluster on enabling markets and institutions.

Flagship 4: Livestock and the environment

This flagship addresses the SRF grand challenges of competition for land, soil degradation, overdrawn and polluted water supplies, climate change and diminishing genetic resources. It does this by enhancing the efficiency of natural resource use, reducing the negative impacts of livestock production on ecosystems while enhancing the positive ones, and adapting livestock systems to future climate change.

The livestock sector is a driver of climate change (emissions from livestock constitute 14.5% of global GHG emissions), and climate change presents both a challenge and an opportunity to the sector. The sector has considerable impact on the environment (water, land use etc.) and is affected by the degradation of the very resource base it depends on. There is a clear strategic reason to include research on climate change and the environmental footprint of animal agriculture, and such research spans multiple disciplines (climate science, policy, social science etc.). One could argue that it may have been preferable to have this work embedded throughout the CRP and targeted through CCAFS. The CRP justifies the development of a full flagship on the grounds that the work was too dispersed in Phase 1, that CCAFS Phase 1 did not sufficiently focus on livestock dimensions of climate change, and that bringing the work together under one FP increases the potential to influence global debates. The ISPC accepts this rationale.

FP4 work will occur through four research strands: (1) compiling accurate livestock baseline emissions; (2) using a systems approach to investigate LS systems, and identify synergies and trade-offs among interventions, environmental impacts, and other non-environmental objectives; (3) using research findings to inform the development of policies and institutions; and, (4) using gender-transformative approaches to provide more control over resource flows and benefits, and to promote women as change agents (for proactive environmental management). The proposal would be stronger if the Theory of Change better articulates how the proposed activities across clusters will amount to a greater whole. For instance, a channel of impact is through shaping policy mechanisms, but depending on the target audience (local institutions, national governments, international bodies, all of which are mentioned), the pathways to impact will look substantially different. Similarly, pathways to impact for policy-oriented work and technologies and management practices that reduce emissions or protect resources are different. A discussion of how the results from various Flagships will be brought together to assess trade-offs and implications for achieving CRP objectives and assess trade-offs would also strengthen the proposal. For example, while ruminants are known to make a very significant contribution to greenhouse gas emissions, the negative environmental impacts of monogastrics are somewhat different. While a systems approach is embedded in CoAs 1 and 2, this does not appear to drive FP4. Then, the question of how specific activities (e.g., improvement in emission measures) will contribute to the larger CRP/CGIAR objectives, beyond potentially contributing to IPCC processes through the introduction of new emissions factors, remains.

While the importance of adapting to climate change is mentioned frequently as one of the important justifications for FP4, detail on strategies and potential approaches is lacking. The focus appears to remain on mitigation, or adaptation at a national level (Uganda and pig value chain).

A CCAFS study (ILRI-based co-author) found that, by 2050, 3% of the land in Africa will not be able to grow maize and will transition from crop-livestock to livestock only with implications for emissions, on-farm adaptation, and resource use. Yet, it is unclear where and how such scenario building/modelling work has fed into the CRP's research priorities. There is clearly some CRP track record on the modelling work (e.g. emissions impacts of future changes in livestock systems and livestock-related land use change with IIASA, CSIRO, and CCAFS), and perhaps on rangeland management. But the continued pursuit of research in other areas (to mitigate externalities on land, soil, and water) is not sufficiently convincing. For instance, even considering the work over decades on forage-legume systems or on brachiaria grass, evidence on adoption as well as precise quantification of environmental impacts is minimal. Hence, the narrative on how things have changed or have been dropped on the basis of past learning could be strengthened.

The FP uses the phrase “gender-transformative” to describe how women (and youth) will be agents of change. The role of the proposed research in empowering women and increasing their decision-making capacity with respect to environmental management (a stated science objective), however, is not evident. Capacity development is discussed in broad terms. One aspect that should be documented rigorously is how policy influence occurs and the effectiveness of the partnership models proposed (e.g. through seconding staff to line ministries). There are some promising research collaborations with CCAFS and WLE on resource management and environment policy issues. External research partners seem appropriate, but information on roles of partners in the FP (and vice versa) is not sufficiently detailed.

Flagship 5: Livestock livelihoods and agro-food systems

The goal of the flagship is to maximize livestock-mediated livelihoods and resilience to risk among women and men smallholder and pastoral producers and their communities. This will be achieved by targeting and prioritizing, integrating and piloting technological and institutional innovations, by integrating this work with that of the other flagships, and by partnering with implementers, investors and advocates of livestock research and development.

Considering the CRP’s TOC, this FP is key to one of the main channels of impact i.e., increasing the incomes and improving the livelihoods of poor livestock keepers. The strategic relevance is high, and the FP TOC is quite direct: it seeks interventions and pursues research that, in principle, will lead to improvements in rural livelihoods. Four strands of work are described: (1) developing innovative ways of generating data on beneficiary populations that will inform investments based on priority setting, spatial targeting, and impact assessment; (2) building on research on gender-transformative approaches undertaken in L&F CRP; (3) researching animal-source food and other livestock-mediated pathways to enhance rural household nutrition; and, (4) working on optimizing livestock systems for productivity and resilience through integrated technologies, institutional innovations, and policy advocacy. The shift in focus from production systems to value chains is appropriate. A few value chains are mentioned such as pig value chains in Uganda and dairy value chains in Burkina Faso, but details on the kind of research that will be undertaken are scant. Hence, FP5 risks appearing as being largely engaged in piloting successful development projects with livestock components, and the narrative could be strengthened by including information on priority value chains and associated research. The open question about what the research in this FP will deliver is echoed in the IEA review (2016), and was noted in the ISPC pre-proposal commentary. IEA recognized the kind of local public and private sector partnerships that have been established in the Livestock and Fish Value Chain Transformation and Scaling work (which is now a part of this FP). It also noted that (1) there were few signs of scaling technologies or methods beyond the countries in which research is taking place, (2) the nine hubs operate as separate research programs, and (3) there has been a low output of publications, even if this could be attributed to a focus on institution building.

High science quality in the context of FP5 work would imply a rigorous approach to designing and testing these interventions (transparent standards for attribution of impacts, clear and sensible counterfactuals etc.), and learning from these experiences to feed the information back into the CRP research planning process. Hence, discussion of the effort that will be put in place to test interventions and to track how livelihoods are changed by different value chain interventions and technologies will strengthen the proposal.

FP5 is very strong in its recognition that interventions that seek to improve rural livelihoods must embrace the complexity of gender roles and the enabling environment. Capacity development initiatives combine traditional approaches with specific activities aimed at increasing innovation capacity (institutional arrangements, learning materials, etc.). It will link with PIM on foresight, policy, value chains, gender and scaling up, and A4NH on nutrition and food safety. The design of the FP requires very close collaboration with non-CGIAR development institutions leaving open questions of how this will occur, and who (within the CRP) has the resource (time) and experience needed to manage such implementation.

FP5 has the second highest overall allocation (21% of CRP budget) alongside FP2. Seventy two percent (72%) of the funding is to come from bilateral sources, and may explain the focus on development activities. The budget, however, appears small to fund local implementation activities, and it is assumed that these activities are primarily funded from other sources. If the FP, however, intends to pay for the full cost of interventions, it is unlikely to be able to do all that it describes and deliver information on what works and what doesn't.